

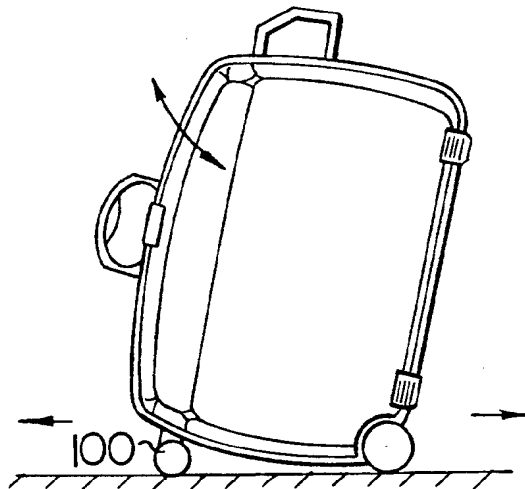


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/US94/04050 <b>(22) International Filing Date:</b> 8 April 1994 (08.04.94)  <b>(30) Priority Data:</b> 5/17951                      9 April 1993 (09.04.93)                      JP  <b>(71) Applicant (for all designated States except US):</b> SAMSONITE CORPORATION [US/US]; 11200 East 45th Avenue, Denver, CO 80239 (US).  <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> TAKAHASHI, Nobuyuki [JP/JP]; 45, Mojirishinmachi 5-chome, Akabira, Hokkaido (JP).  <b>(74) Agent:</b> O'CONNOR, Gregory, W.; Samsonite Corporation, 11200 East 45th Avenue, Denver, CO 80239 (US).		<b>(81) Designated States:</b> AU, CA, CN, HU, KR, RU, UA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

**(54) Title:** A FOLDING CASTER FOR HAND LUGGAGE**(57) Abstract**

Prior rotating casters for luggage require a relatively wide base on which an equally wide wheel support is rotatably mounted. Such constructions have many moving parts, are bulky, and thus do not blend themselves to folding out of the way. Disclosed is a folding caster (100) for a hand luggage that is attached and supported in a housing (1) with the mounting center line (L) of the caster support unit (4). This support unit (4) is of a resilient plastic and slender shape with a portion (12) which pivots and supports the casters (3) and a supporting portion (14) for the shaft (2) which run along the previously mentioned mounting center line to provide the capability of folding into the housing. The caster pivoting support portion (12) is approximately one half the width of the shaft support portion (14). The line (L), which is perpendicular to the line which runs through the transition where the width (16) of the shaft support portion (14) changes to the width (18) of the caster support portion (12), and thus indicates the direction of the bending moment in response to the outer force (F) which is applied by the ground to the ground contacting edge of the caster (3). The bend motion in the plane (R) determines the amount of the steering or turning in the direction of the caster shaft.



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## A FOLDING CASTER FOR HAND LUGGAGE

Background of the Invention

10 The present invention pertains to a thin, compact type  
caster for a hand luggage preferably with folding  
capability.

15 In the past, as shown in figure 1, a hand carried bag was  
moved manually by pulling it in the direction of the arrow  
with only casters on the lower corner of the case.  
Therefore, there was a constant downward load applied on  
the hand. These types of bags are priced at a relatively  
low cost, whereas higher priced bags are equipped with two  
swivel type casters and two fixed type casters. Due to the  
cost constraint, the lower priced version could not afford  
20 to be equipped with those swivel type casters. Thus, at  
least until this invention, there has been no development of  
a lower priced version of swivel type casters, so the only  
type of lower priced hand carried bags available in the  
market has been the type with fixed casters.

25 In addition, as shown in figures 2 and 3, the direction of  
the wheel in the existing swivel type casters has been  
determined by rotating the support unit 52 on the mounting  
base 51. Since there is a caster angle 56 in between the  
swiveling axis 54 and the caster shaft 55, the support unit  
52 will rotate in response to being subjected to the force  
30 "W", as for example when the caster wheel is subjected to  
a turning motion of the luggage case to which it is  
attached. As a result, the width 57 of the support 52 must

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be substantial to resist distortion when subjected to such side forces. the mounting base itself should have a similar dimension to provided adequate bracing of the support unit in all directions. Because of these dimensional constraints, it has been difficult to design a compact type caster.

#### Summary of the Invention

Accordingly, the purpose of this present device is to eliminate the existing weaknesses stated earlier and to offer a lower price type of swivel caster which sufficiently performs its function even when mounting just one such wheel at the location on a hand carried bag where there is no existing caster. In addition, the purpose is to offer a convenient caster which can fold up and store away when it is not in use.

#### Brief Description of the Drawings

Figure 1 shows a prior art luggage case with two fixed wheels.

Figure 2 is side view which of an existing caster in the "in-use" position.

Figure 3 is a front view, partially in section, of the prior art caster of Figure 2.

Figure 4 is a plan view of the preferred embodiment of my

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compact caster with the caster wheel extending out from its housing in the "in use" position.

Figure 5 is a front view of the compact caster as shown in Figure 4.

5 Figure 6 is a frontal view which shows the caster extending out from the housing half-way.

Figure 7 is a plane view, partially in section, which shows the caster in the stored position.

Figure 8 is a side view of the support unit

10 Figure 9 is a frontal view of the support unit

Figure 10 is an angled view showing the caster mounted on a suitcase.

Figure 11 is a side view of a case showing my caster in its operating position on a case.

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#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A folding caster 100 for a hand carried bag is attached and supported with the mounting center line L of the caster support unit 4. This support unit 4 is of slender design, and is made from a resilient polymer or plastic material. This support unit a first portion 12 which supports the pair of caster wheels 3 for rotational movement about an axle 11 interconnecting the caster wheels. The support

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unit also includes second portion 14 integrally formed with the first portion 12. This portion is mounted on a shaft 2 which runs along the previously mentioned mounting center line to provide folding capability as will be detailed.

5 The portions 12 and 14 merge or are connected to one another preferably along a curving line 13 which is just beyond the largest diameter of the caster wheels 3. The caster pivoting portion 12 has a width dimension 18 which is approximately one half the width dimension 16 of the

10 shaft support unit. Thus, should the caster wheels mounted on the unit 4 be subjected to a side force  $F$  by the ground (that is, a force having a component which is perpendicular to the normal direction of rolling of the casters,) this force would be perpendicular to the locus linear direction

15  $Q$  at the merging line or transition 13 where the width of the shaft support portion 14 merges with the width of the caster pivoting portion 12. This force would apply a bending moment to the support unit 4, which would bend over in response to this moment, as shown for example by the

20 angle  $\beta$  in Figure 5. Because of the angle the direction  $R$  relative to the horizontal, the support unit also steers the casters as shown for example by the angle  $\alpha$  in Figure 4. Thus, the bending in the plane containing  $R$  determines the amount of angling or steering the casters do in

25 response to the side thrust force  $F$ .

As shown in Figures 4 through 9, this present device 100 is composed of a housing 1 which is mounted on an end surface of an otherwise conventional two wheeled luggage case, the support unit 4 and the casters 3 which are rotatably

30 mounted on the housing 1 by the shaft 2, a fastening slider 6 and two coil springs 7 and 8 which are designed to store

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the casters 3 and the support units 4 in the storage cavity 5 provided in the housing or extend out as shown in Figure 4.

5       The shaft 2 is designed to slip along its axis in the support unit 4 and is equipped with a button 9 on one end and the previously mentioned fastening slider 6 on the other end. Also, the shaft 2 separates the clutch 10  
10       designed on the support unit 4 and the fastening slider 6 and sets the compressed coil spring 7, which normally urges the shaft 2 and fastening slider into engagement with one another and thus into a locking direction. The fastening  
15       slider 6 thus moves with the shaft when the button 9 is pushed against the bias of the spring 8 in between the inner surfaces of the fastening slider-6 and the housing 1. In addition, the remaining coil spring 7 is set within the channel 12 provided around the shaft 2 of the support unit-4 so that the support unit can extend out from the housing 1 when the clutch 10 is released from the fastening slider  
20       6 as shown in Figure 6.

The concept of the present device thus concerns a folding caster described in the above practical example is furnished on the support unit 4 shown in Figures 5 and 6.

25       In other words, without providing existing types of swivel mechanisms on the support unit 4, the moving direction of a caster will be changed strictly by the steering action of the support unit.

30       The operation of the caster wheel device will now be discussed. Upon pushing a button 9, the fastening slider-6 will release from the clutch 10. Thus, with the spring

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action of the coil spring 9, the support unit 4 will rotate and extend out by approximately 45° from the housing 1 as shown in Figure 6. This angle will always be set at 45° so long as the button 9 is pushed from the neutral position. 5 Thereafter, by manually pushing the support unit-4 and placing it in the "in-use" position as shown in Figure 4 and 5, the slider 6 will provide a steady support by joining the slider 6 and the support unit 4 with the spring action of the spring 8 urging the slider 6 and the clutch 10 into gear-like engagement with one another.

When storing the subject device, the same procedures will be used in reverse.

Thus, the user can easily move the case in the manner shown in Figure 11 without having to drag the load by hand. 15 Since the swiveling function can be achieved by the deflection of the caster support unit, it is possible to produce a very slender type of caster. Yet, when the folding caster is stored in the storage cavity, the user can handle the hand carried bag with the caster in the same 20 manner as the existing type of two wheeled luggage cases. In addition, by successfully making a caster compact, the caster that extends out when it is in use can be stored in an extremely compact fashion when it is not in use without impairing the size of the bags currently in existence. 25 Therefore, it is easy to load as luggage when moving a long distance at an airport and etc. Furthermore, considering the product distribution, the cost will be lower and at a higher quality hand carried bag can be offered at a lower price.

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## CLAIMS

## I Claim:

1. A folding caster assembly for permitting a hand luggage to be rolled across a horizontal surface, including at least one wheel, axle means for rotatably mounting said wheel, means for supporting said wheel for contact with the horizontal surface, means for mounting said means for supporting to the hand luggage, said means for supporting comprising a first part attached to said mounting means, and a relatively flexible part extending from said first part to said shaft means, the first part attached to said relatively flexible second part at a location substantially corresponding to a plane extending at an acute angle to said horizontal surface when the wheel is operatively contacting the horizontal surface, said plane extending parallel to but spaced from the axis of the axle means, said relatively flexible part being made of a generally resilient material such that, when the wheel is subjected to a force parallel to the axis of the axle means, the flexible part bends, whereby the axis of the axle means rotates, and thus the wheel turns relative to the means for mounting.

2. A folding caster assembly as set forth in Claim 1 further including means rotatably connecting said means for mounting with said means for supporting, and further including means for holding the means for mounting in an operative position relative to the means for mounting, and in a folded position relative to said means for mounting, and wherein said means for mounting includes a cavity which

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is sized to receive the wheel and the means for supporting when in the folded position.

5        3.    A folding caster assembly as set forth in Claim 1 further including a pair of wheels mounted on the axle means, each of the pair of wheels being arranged on opposing sides of the means for supporting.

10       4.    A folding caster assembly as set forth in Claim 1 wherein said means rotatably connecting the means for mounting with the means for supporting includes a shaft, a slide carried by the shaft, the slide and shaft mounted for axial sliding motion on the means for mounting, the shaft rotatably mounted through at least a portion of the first part of the means for supporting, the slide selectively engaging the first part of the means for mounting, clutch surfaces provided on the slide and the means for supporting, the clutch surfaces being brought into and out of engagement with one another by the sliding motion of the shaft and the slide, whereby the means for supporting and the wheel carried thereby can be held in an operative position to engage a horizontal surface over which a hand luggage is to be rolled, or in an inoperative position.

25       5.    A steerable caster assembly comprising at least a first wheel, a support means for holding the wheel in operative engagement with the surface over which the wheel is to be steered, the support means having a first relatively rigid portion, and a second, relatively flexible portion, the first and second portions forming an interface with one another in a plane which is at an acute angle with the surface over which the wheel is to be steered, the

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flexibility of the second portion of the support means being of such degree that a side force on the wheel as would be applied during ordinary use of the caster assembly causes the support means to bend at the interface, whereby  
5 the direction of the rolling of the wheel changes with the bending of the support means.

6. A steerable caster assembly as set forth in Claim 5 further including a second wheel mounting on an opposite side of the relatively flexible portion of the support  
10 means from the first wheel to form a pair of wheels.

7. A steerable caster assembly as set forth in Claim 5 wherein the first and second portions of the support means are integrally formed of a resilient plastic material.

8. A steerable caster assembly as set forth in Claim 7  
15 wherein the first portion of the support unit has a thickness dimension which is perpendicular to the plane of rolling of the wheel, and the second, relatively flexible portion has a thickness dimension which is about one half that of the thickness dimension of the first portion.

9. A steerable caster assembly as set forth in Claim 8  
20 further including a second wheel, the first wheel and the second wheel being mounted on a common axle means on opposite sides of the second portion of the support means.

10. A steerable caster assembly as set forth in Claim 9  
25 wherein the interface is a transition between the thickness dimension of the first portion and the thickness dimension of the second portion, this transition occurring along a

-10-

curving line along a circle slightly larger than the  
outermost diameter of the wheels.

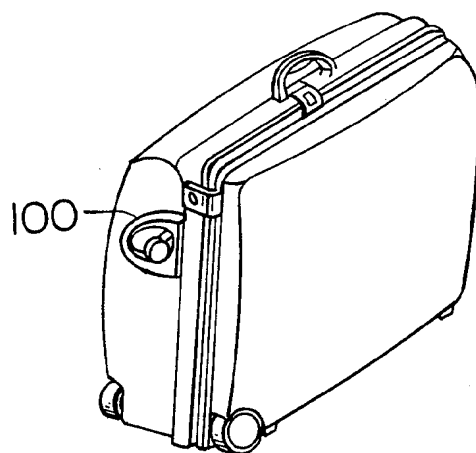


FIG. 10

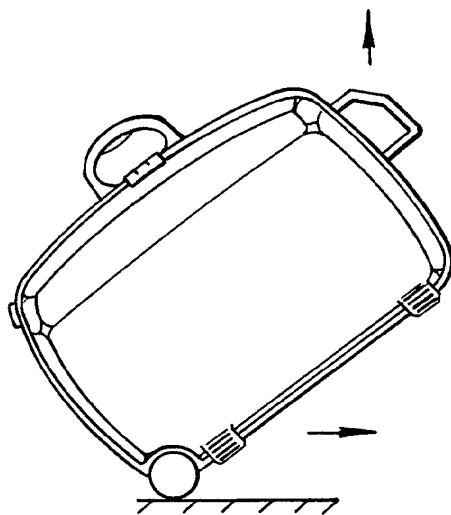


FIG. 1  
(PRIOR ART)

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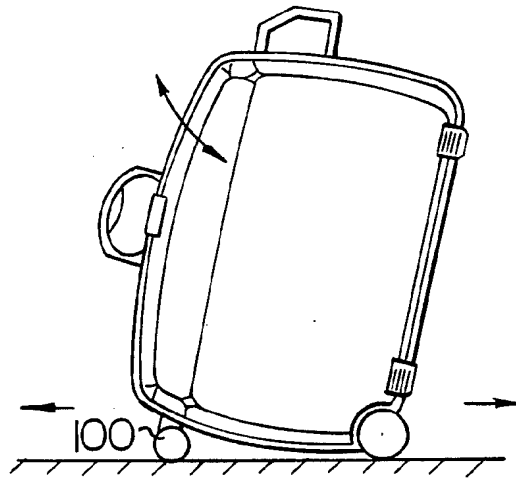


FIG. 11

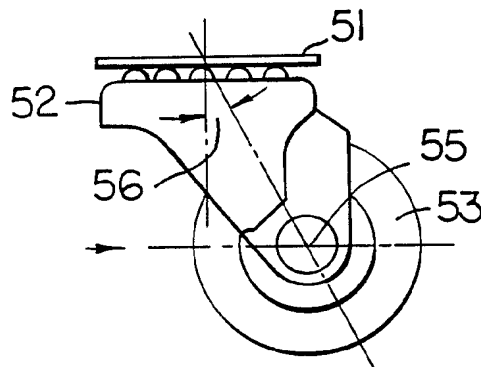


FIG. 2

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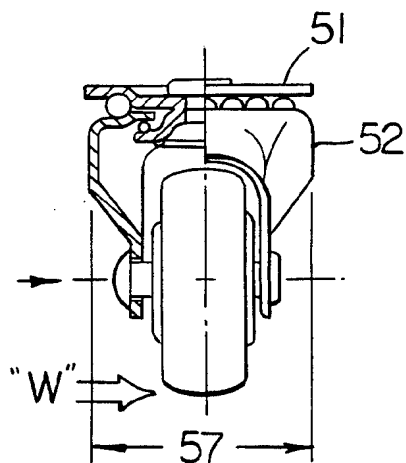


FIG.3

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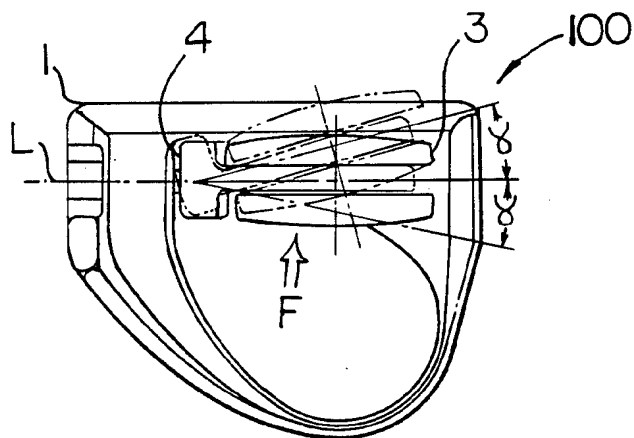


FIG. 4

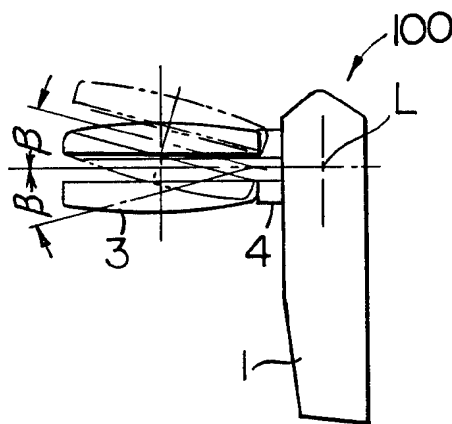


FIG. 5

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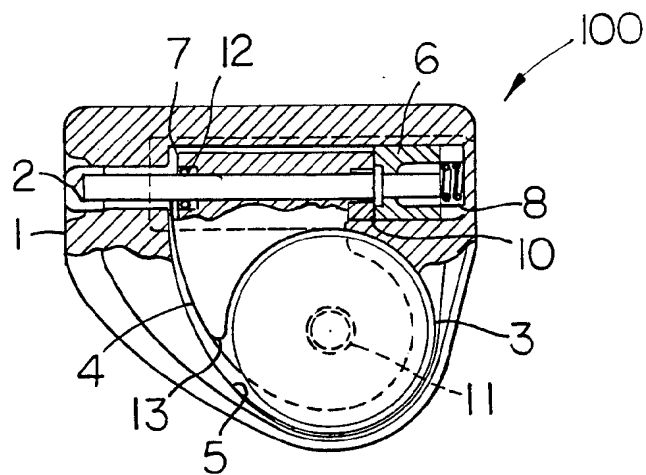


FIG. 7

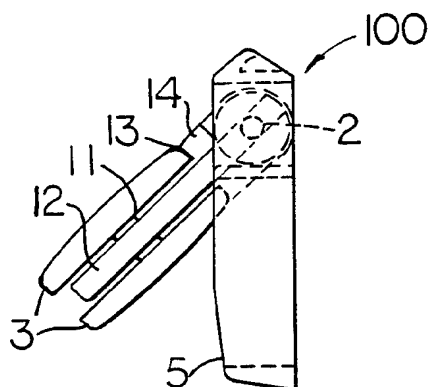


FIG. 6

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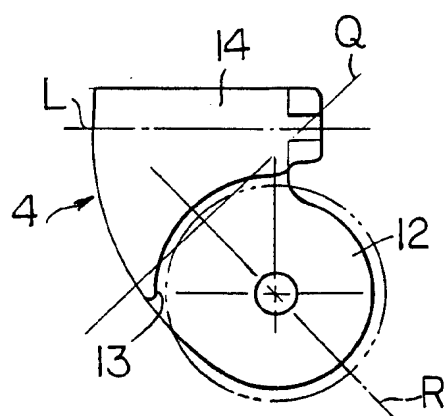


FIG. 8

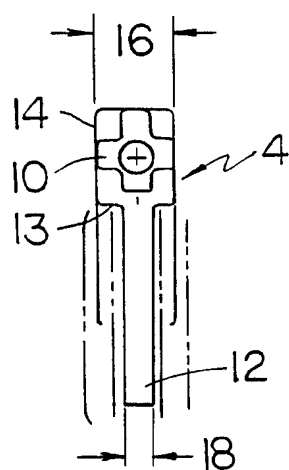


FIG. 9

## INTERNATIONAL SEARCH REPORT

 International application No.  
 PCT/US94/04050

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :B60B 33/00

US CL :16/45,34

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 16/45,29,32,33,34,35R,19,18R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4,351,084 (FONTANA) 28 SEPTEMBER 1982 SEE ENTIRE DOCUMENT)	1,3,5-10
X	CA, A, 880,607 (HARLANG) 14 SEPTEMBER 1971 (SEE ENTIRE DOCUMENT)	1,3,5-10
Y	US, A, 4,217,675 (HAFT) 19 AUGUST 1980 (SEE ENTIRE DOCUMENT)	1-10
Y	US, A, 4,092,760 (LOEWE) 06 JUNE 1978 (SEE ENTIRE DOCUMENT)	1-10
A	US, A, 4,793,022 (RAFFAELI) 27 DECEMBER 1988	1-10
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 5,154,265 (CAPISTRANT) 13 OCTOBER 1992	1-10
X	US, A, 267,712 (PEDERSON) 21 NOVEMBER 1882 (SEE ENTIRE DOCUMENT)	1,3